

**Description of a new viviparous species of *Dentatisyllis*  
(Polychaeta: Syllidae) from Belize with an assessment of  
growth and variation, and emendation of the genus**

David E. Russell

Department of Biology, Washington College, 300 Washington Avenue,  
Chestertown, Maryland 21620-1197, U.S.A.

*Abstract.*—*Dentatisyllis mangalis*, a new viviparous species of syllid polychaete, is described from mangrove and adjacent shallow-water habitats of Twin Cays, Belize. The new species is distinguished by a combination of short dorsal cirri with only a few articles and compound falcigers with long tapering blades bearing bifid tips. Analysis of meristic and linear characters used in classical syllid taxonomy revealed that the mean number of articles per dorsal cirrus per individual increases only slightly with increasing body length (growth); proventricle length increases linearly with body length; and the ratio of proventricle length to width is relatively independent of body length. Furthermore, overall growth is accomplished more by the addition of segments than the elongation of existing ones. The genus diagnosis is emended to include the presence of nuchal organs.

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An investigation of the diversity and distribution of syllid polychaetes inhabiting shallow-water habitats at Twin Cays, Belize, has recorded a number of known and previously unknown species of the subfamilies Exogoninae and Eusyllinae (Russell 1989a, 1989b, 1991). Species of the subfamily Syllinae collected from these habitats include the new viviparous species of *Dentatisyllis* Perkins, 1981, described herein. The new species is illustrated and the variability of selected linear and meristic characters is evaluated.

The viviparous mode of reproduction, exhibited by the new species and documented herein, is particularly noteworthy. Brooding, however, is quite common in syllids, and internal brooding with direct development (viviparity) has been reported (including the present paper) for seven species (San Martín 1984, Wilson 1991).

#### Materials and Methods

Specimens were obtained from core samples collected along a 40-m transect span-

ning a continually submerged mangrove forest, a shallow unshaded algal flat, and a turtlegrass (*Thalassia testudinum*) meadow. Depth along the transect at time of sampling ranged from 9 to 130 cm. Further description of the habitats sampled and explanation of the core sample labels (used below under "Type material") are provided by Russell (1989a).

Material was fixed in a seawater solution of approximately five percent formaldehyde and one percent methanol, stained with Rose Bengal, and preserved in 70% ethanol. Specimens were examined by mounting them temporarily on slides in a medium of glycerin and 70% ethanol (1:1).

Linear measurements were made using an ocular micrometer. Body length was measured from the posterior margin of the tentacular segment to the posterior tip of the pygidium; body width across the proventricle without the parapodia. The mean number of articles per dorsal cirrus was determined for each type specimen by counting the articles in one dorsal cirrus on each se-

tiger, provided a dorsal cirrus was present and could be seen in its entirety. Occasionally both dorsal cirri of one setiger were counted and the number of articles comprising each cirrus differed. In such instances the larger number was used in the calculation of the mean to ensure that the data was not biased toward the conclusion that the species is characterized by short (few articles) dorsal cirri, a possibility that was of particular interest. The dorsal cirri on setiger 1, which appeared to always be longer than other dorsal cirri, and the dorsal cirri on the last three setigers, which typically were shorter than others, were not included in the mean. It was assumed that the number of articles comprising these cirri was strongly determined by their position on the body, and that, in individuals with only a few dorsal cirri (e.g., small individuals or individuals that have lost dorsal cirri), including these cirri in the mean would result in a value that was not representative. Consequently, they were omitted from counts on all individuals.

Summary statistics and the product-moment correlation coefficient ( $r$ ) were calculated using Microsoft Excel (version 4.0). Prior to the calculation of  $r$  for the relationship between body length and the ratio of proventricle length to width, the latter was transformed using a  $\log_{10}$  transformation due to the tendency of ratios not to be normally distributed (Sokal & Rohlf 1981).

Type material has been deposited in the National Museum of Natural History (USNM), Smithsonian Institution, Washington, D.C., U.S.A. Comparative material was borrowed from the Museo Nacional de Ciencias Naturales de Madrid (MNCNM), Madrid, Spain.

### Systematics

Family Syllidae Grube, 1850

Subfamily Syllinae Rioja, 1925

Genus *Dentatisyllis* Perkins, 1981,  
emended

*Diagnosis.*—Holotype of the type species, *Dentatisyllis carolinae* (Day, 1973)

with two ciliated slits along the posterior margin of the prostomium, one on either side of the dorsal midline, each indicating the presence of a nuchal organ.

*Remarks.*—Nuchal organs were reported absent in the original generic diagnosis (Perkins 1981), which is otherwise complete and accurate.

*Dentatisyllis mangalis*, new species

Figs. 1–3; Tables 1, 2

*Dentatisyllis brevicirra*—Wilson, 1991:506  
*nomen nudum.*

*Type material.*—Holotype: T-4LB (USNM 102495). Paratypes: M-3, 1 (USNM 102496); C-3, 2 (USNM 102499); C-5, 1 (USNM 102500); C-8, 1 (USNM 102502); T-2LF, 3 (USNM 102510); T-2LB, 2 (USNM 102511); T-4UB, 1 (USNM 102512); T-4LB, 4 (USNM 102513); T-5UB, 1 (USNM 102514); T-5LF, 1, (USNM 102515); T-7F, 3 (USNM 102516); T-7B, 3 (USNM 102517); T-9F, 2 (USNM 102518); T-9B, 2 (USNM 102519); T-11F, 3 (USNM 102520); T-11B, 4 (USNM 102521). All types from West Bay, Twin Cays, Belize (16°50'N, 88°05'W); 9–130 cm depth; collected Nov 1983.

*Additional material examined.*—*Dentatisyllis carolinae* (Day, 1973), holotype (USNM 43146); 4 paratypes (USNM 43147) off Beaufort, North Carolina, North Atlantic: 20 m, May 1965. *Dentatisyllis* sp. A of Uebelacker, 1984, 1 specimen (USNM 65669), id. by Barry Vittor and Associates, off Crystal River, Florida, Gulf of Mexico: 38 m, Nov 1977. *Dentatisyllis junoyi* López & San Martín, 1992, holotype (MNCNM, 16.01/802), off Curral Velho, Boavista Island, Cape Verde Islands, North Atlantic, 15 m, Aug 1985; paratype (MNCNM, 16.01/803), off Salamanca, Sao Vicente Island, Cape Verde Islands, North Atlantic.

*Description.*—All type specimens complete. Body slender and approximately oval in cross-section; pale yellow without markings; length without palps, prostomium, and tentacular segment, 0.8–3.9 mm; width

Table 1.—Summary statistics for selected features of *Dentatisyllis mangalis*.

Feature	Range	$\bar{X}$	SD	n
Body				
length (mm)	0.8–3.9	2.1	0.7	35
width (mm)	0.1–0.2	0.17	0.32	18
number of setigers	19–47	33	7.4	35
Proventricle				
length ( $\mu\text{m}$ )	200–430	308.6	61.1	35
width ( $\mu\text{m}$ )	70–150	103.6	17.7	33
length/width	2.1–3.9	3.0	0.4	33
Number of articles				
median antennae	7–13	10.6	1.7	28
lateral antennae	4–8	6.1	1.2	37 <sup>a</sup>
dorsal tentacular cirri	4–10	7.3	1.8	24 <sup>a</sup>
ventral tentacular cirri	2–5	3.0	1.2	5 <sup>a</sup>
dorsal cirri of setiger #1 <sup>b</sup>	4–10	7.9	1.6	28
anal cirri	4–10	6.4	1.3	33

<sup>a</sup> Some on same individual.

<sup>b</sup> Summary statistics for other dorsal cirri are presented in Table 2.

across proventricle without parapodia 130–230  $\mu\text{m}$ ; number of setigers 19–47. (Table 1 provides descriptive statistics for these and other quantitative features.)

Prostomium oval, 1.5–3 times wider than long, with two pairs of lensed eyes on posterior half of prostomium in a flattened trapezoidal arrangement (Fig. 1A). A third pair of smaller eyes (eyespot) present on anterior portion of prostomium, one at the base of each lateral antenna. Median antenna with 7–13 articles, arising between posterior pair of eyes; lateral antennae with 4–8 articles, originating on anterior portion of prostomium. Palps triangular, free for most of length; appear strongly contracted in most specimens. A pair of nuchal organs, each in a narrow ciliated groove on either side of the dorsal midline along posterior margin of prostomium (Fig. 1A).

Dorsal tentacular cirri with 4–10 articles; ventral tentacular cirri with 2–5 articles. Dorsal cirri on setiger 1 longest with 4–10 articles, all other dorsal cirri with 3–8 articles, fewer in posteriormost 3–4 setigers. Mean number of articles per dorsal cirrus increases with body length (Fig. 3A). (Table 2 provides descriptive statistics on the num-

ber of articles in dorsal cirri by individual.) First article of tentacular and dorsal cirri typically slender and cylindrical (Fig. 1B), arising from a short broader cirrophore; other articles of these cirri larger, rounded or bulbous. Ventral cirri short, not extending beyond parapodia, larger and bulbous in anterior setigers (Fig. 1C), becoming digitiform and tapering slightly in middle and posterior setigers (Fig. 1B). Pygidium short, semicircular, with terminal anus (Fig. 1D) and two anal cirri each with 4–10 articles usually larger than articles of dorsal cirri; with or without a third short smooth anal cirrus arising midventrally between articulated anal cirri.

Aciculae slightly enlarged distally, tips protruding from parapodia through cuticle; 2 slender aciculae per parapodium in anterior setigers, tip of one less oblique than the other (Fig. 1E); aciculae solitary and heavier in middle and posterior setigers (Fig. 1F). Simple setae present only in posterior setigers: superior simple setae (Fig. 2A) solitary, about as long as shafts of compound falcigers, blunt bilobed to bifid tips, fine distal serrations typically along superior surface, approaching plumose condition; inferior



Table 2.—Summary statistics by specimen of *Dentatisyllis mangalis* for number of articles in dorsal cirri.

Holotype (H) or Paratype (P)	Range	$\bar{X}$	SD	$n^a$	$n$ as Percentage of Total Number of Setigers
H	4–8	6.0	0.7	31	94
P	4–7	5.9	0.8	30	70
P	5–6	5.1	0.4	15	58
P	4–6	4.9	0.9	21	76
P	6–8	6.6	0.7	8	23
P	3–7	5.2	0.9	17	74
P	4–7	5.4	0.9	21	55
P	4–7	5.2	0.9	15	50
P	6–7	6.3	0.5	15	35
P	3–5	4.1	0.5	13	72
P	4–6	5.2	0.5	18	62
P	5–7	5.5	0.6	19	54
P	4–5	4.4	0.5	20	91
P	4–5	4.6	0.5	21	84
P	4–5	4.7	0.4	21	100
P	5–8	6.4	0.7	37	88
P	4–6	5.2	0.6	24	77
P	4–6	5.5	0.6	24	89
P	4–6	5.1	0.6	21	78
P	4–7	5.9	0.7	23	82
P	3–4	3.8	0.4	13	81
P	4–6	5.3	0.6	21	75
P	4–6	5.1	0.7	17	57
P	3–6	5.4	0.8	28	76
P	3–4	3.9	0.3	16	94
P	3–5	4.2	0.6	19	86
P	4–6	4.9	0.5	27	96
P	5–7	6.1	0.5	35	92
P	5–7	5.6	0.6	33	94
P	3–6	5.1	0.6	25	89
P	4–6	5.0	0.5	18	64
P	4–7	5.8	0.7	30	94
P	4–5	4.2	0.4	13	62
P	5–7	5.7	0.5	34	100
P	4–5	4.1	0.3	15	100

<sup>a</sup> Number of dorsal cirri examined. Only one cirrus (when present and visible) from each setiger was included in count.

simple setae shorter, solitary, slightly curved (Fig. 2B), with bifid tips and fine distal serrations along inferior surface. About 9 compound setae per anterior fascicle, number gradually decreasing posteriorly to 3 or fewer per fascicle in last few posterior setigers. Compound falcigers with bifid serrated blades (Fig. 2C–E). Blades of superiormost falcigers long, narrow, taper-

ing to minutely bifid tips with knob-like terminal tooth; longest in middle and posterior setigers. Commonly 2 of these long-bladed falcigers per fascicle in anterior setigers, usually 1–2 per fascicle in other setigers, occasionally absent from a fascicle.

In mature specimens, pharynx usually extending to setiger 7 when inverted, to setiger 5 when everted, about equal in length to proventricle, with an anterior mid-dorsal tooth; anterior end surrounded by 10 large papillae or lobes, tips ciliated; anterior margin of pharynx denticulate (Fig. 2F), with 10 distinct teeth arranged in opposition to pharyngeal lobes, tooth shape sometimes rough and irregular. Proventricle length 200–430  $\mu\text{m}$ , width 70–150  $\mu\text{m}$ , length to width ratio 2.1–3.9, with about 32 muscle rows. Proventricle length exhibiting a more or less linear relationship with increasing body length (Fig. 3B). Proventricle length to width ratio remaining relatively constant or increasing slightly with increasing body length (Fig. 3C).

Reproduction through viviparity; holotype and numerous paratypes with from 1 to 4 young present in coelom (Fig. 2G). Young not enclosed within a membrane; with up to 13 setigers bearing setae similar to those of adult.

*Etymology.*—The species name refers to the mangrove community or mangal (*sensu* MacNae 1968; Tomlinson 1986) that is a conspicuous feature of the type locality.

## Discussion

*Synonymy.*—*Dentatisyllis brevicirra*, as used by Wilson (1991:506, table 2), is a *nomen nudum* according to the International Code of Zoological Nomenclature (Third Edition 1985). That name had been, prior to Wilson's paper, only informally proposed by me in a conference poster for the concept herein established as *D. mangalis*.

*Comparison to congeners.*—*Dentatisyllis mangalis* agrees with the generic diagnosis (as emended above) and resembles *Dentatisyllis carolinae* (Day, 1973), Perkins

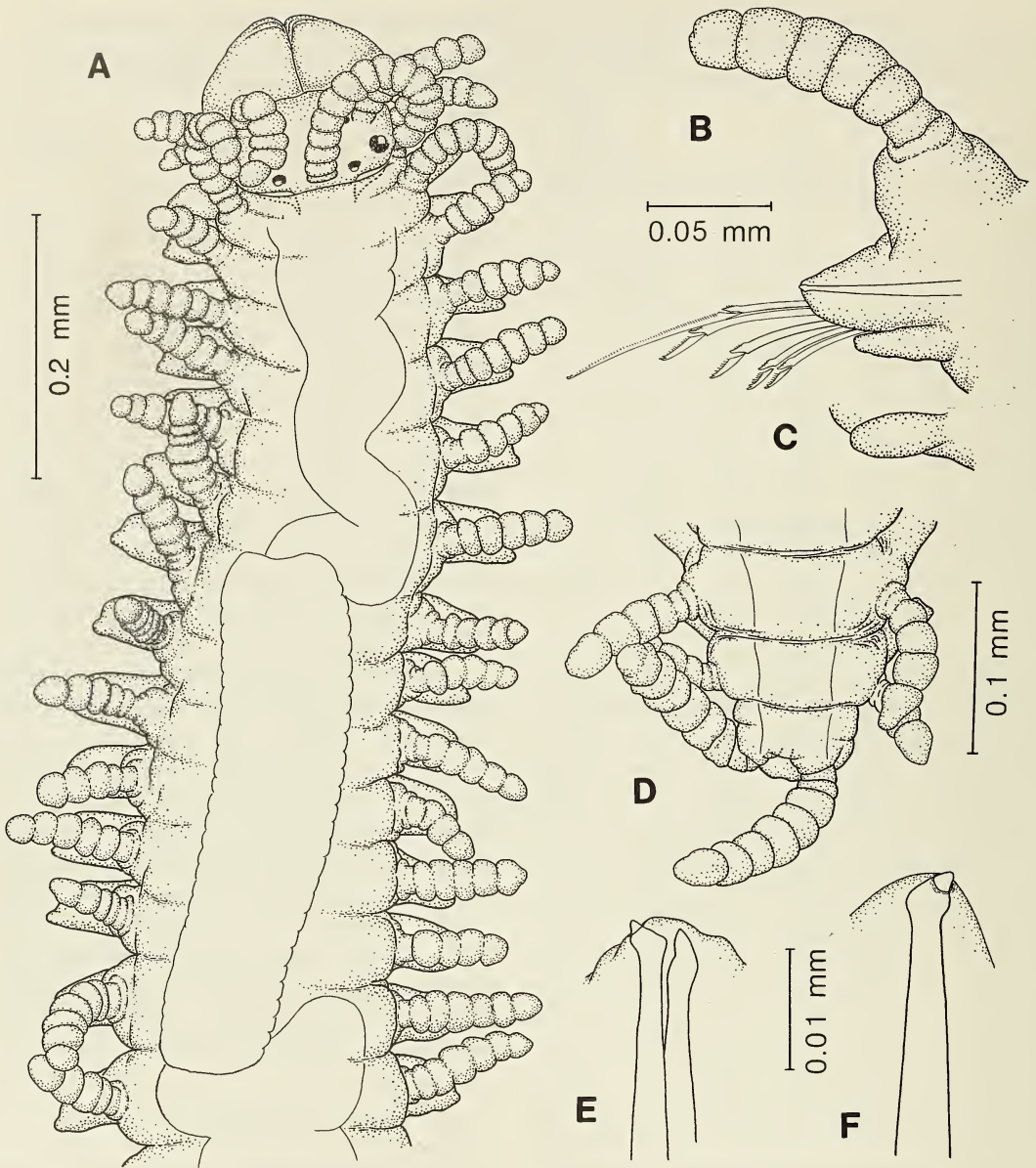


Fig. 1. *Dentatisyllis mangalis*, new species. A. Anterior end, contracted (setae not drawn). B. Parapodium from middle setiger, posterior view. C. Ventral cirrus on anterior setiger, posterior view. Scale same for B and C. D. posterior end, dorsal view (setae not drawn). E. Aciculae and tip of parapodium from anterior setiger. F. Acicula and tip of parapodium from middle setiger. Scale same for E and F. A from paratype USNM 102515; B, C, E, F from paratype USNM 102516; D from paratype USNM 102511.

(1981:1166, fig. 38a–h) with respect to the bifid simple setae and superior compound falcigers, but differs by having antennae, tentacular cirri, and especially dorsal cirri comprised of relatively few articles, with

the first article of dorsal cirri consistently more slender and cylindrical than others; only two aciculae per anterior parapodium; superiormost compound falcigers with long narrow blades; blades of other compound

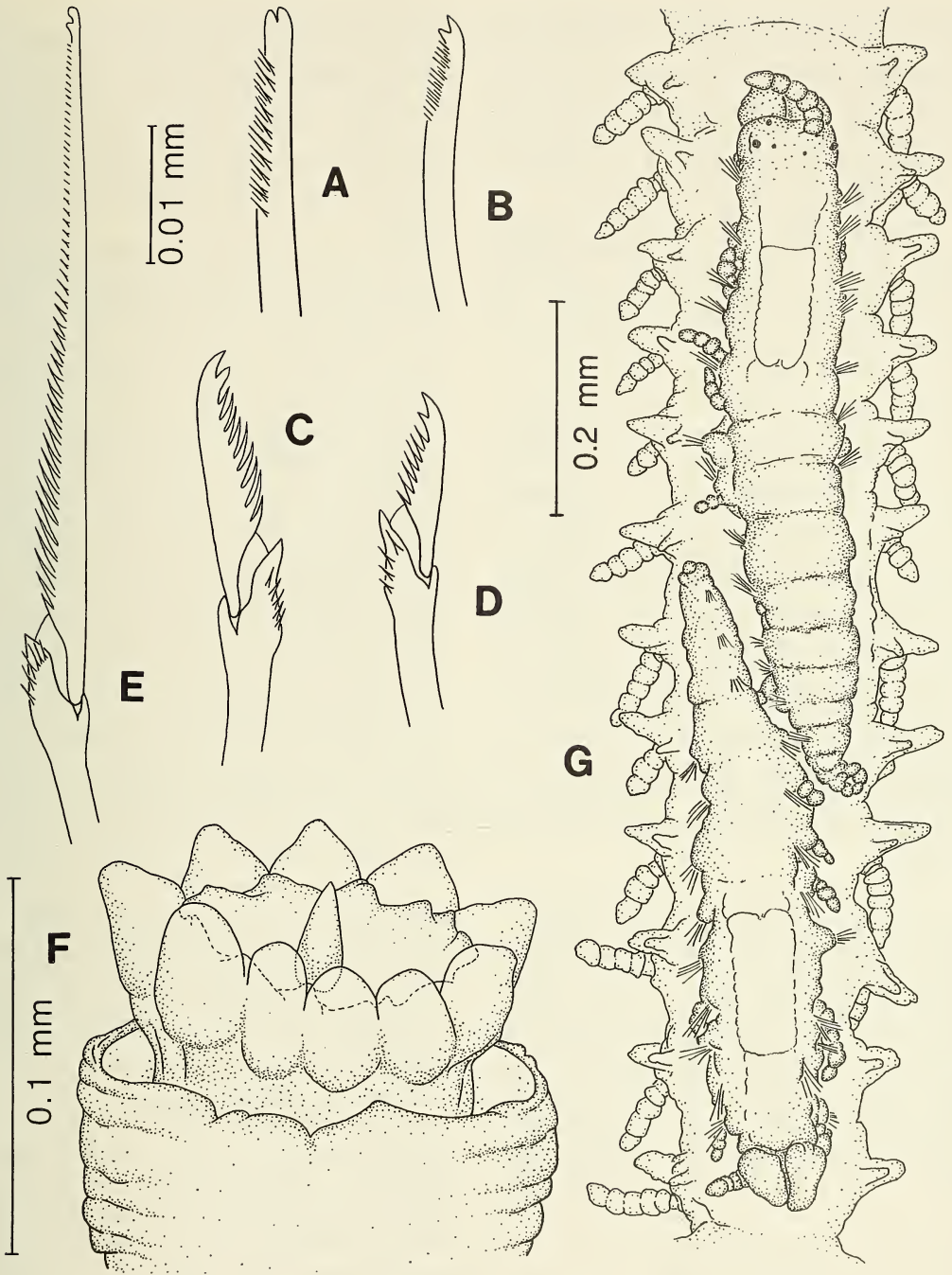


Fig. 2. *Dentatisyllis mangalis*, new species. A. Superior simple seta from posterior setiger. B. Inferior simple seta from posterior setiger. C. Superior compound falciger from middle setiger. D. Inferior compound falciger from anterior setiger. E. Compound spiniger-like seta from anterior setiger. Scale same for A–E. F. Anterior end of everted pharynx, ventral view. G. Two offspring prior to release, dorsal view of one, ventral view of other, inside setigers 21–32 of adult in ventral view, setiger 21 at top of figure (some external structures of offspring obscured by adult’s internal structures, especially musculature associated with aciculae in each parapodium; setae of offspring included where visible; setae of adult not drawn). A, B from paratype USNM 102510; C–E from paratype USNM 102516; F from paratype USNM 102511; G from holotype USNM 102495.



falcigers with sharply pointed terminal and subterminal teeth; blades of inferior compound falcigers without enlarged subterminal tooth; and a typically smaller body size. *Dentatisyllis mangalis* differs in the same ways from *Dentatisyllis* sp. A of Uebelacker (1984:30.115, fig. 30.110 a–d).

The new species also resembles *Dentatisyllis junoyi* López & San Martín, (1992: 219, fig. 1a–l) particularly with regard to the superiormost compound falcigers with long narrow blades bearing bifid tips (called “spiniger-like setae” by López and San Martín, 1992), but differs by having antennae, tentacular cirri, and, most notably, dorsal cirri comprised of relatively few articles, with the first article distinctly cylindrical. *Dentatisyllis mangalis* differs further by having ventral cirri clearly shorter than parapodial lobes, compound falcigers without an enlarged subterminal tooth or long slender serrations (or spines) arising from the distal margin of the blade, superiormost compound falcigers with long narrow blades along the entire body (sometimes two per fascicle in anterior setigers), and blades of these falcigers without long slender serrations arising from the distal blade margin.

*Viviparity, growth, and morphological variation.*—One of the most interesting aspects of the new species is its viviparous reproduction. Setigerous young are present in the coelom of a number of type specimens (Fig. 2G), including a paratype with as few as 30 setigers and a length of 1.6 mm. The brooded young were originally overlooked in some adult specimens. Their presence can be obscured by the alimentary tract, acicular and parapodial muscles, and other organs of the adult. The brooded young are most easily recognized by their proventricle, palps, and dark eyes. The apparent lack of a membrane enclosing each offspring, including those removed from brooding adults for closer study, suggests that ovoviviparity is unlikely.

The means by which offspring leave the adult is not known; however, once released,

individuals appear to grow more by the addition of setigers than by the elongation of existing setigers, as indicated by a fairly linear relationship between body length and the number of setigers (Fig. 3D). This close relationship indicates that setigers grow to full size fairly rapidly, soon after they are formed.

Perhaps the most distinguishing and conspicuous feature of *Dentatisyllis mangalis* is the dorsal cirri, each consisting of relatively few articles (from three to eight), except for those on setiger 1 which are typically longer. In contrast, *D. carolinae* has 27 articles per dorsal cirrus on some anterior setigers (excluding setiger 1), thereafter about 30 on “short” dorsal cirri and about 55 on “long” dorsal cirri (Perkins 1981). Similarly, *D. junoyi*, has 7 to 9 articles on “short” dorsal cirri and 14 to 21 articles on “long” dorsal cirri (López & San Martín 1992). (Except on a few anterior setigers, “short” and “long” dorsal cirri in the latter two species, as in many Syllinae, alternate throughout the body. Such alternation was observed on only a few specimens of *D. mangalis*; the difference between “short” and “long” cirri was only one or two articles.) Observations I have made of numerous specimens from Belize belonging to other genera of the subfamily Syllinae, as well as the observations of others (e.g., Perkins, 1981:1169), have suggested that within a species the length of dorsal cirri and the number of articles comprising them probably increases with body size; small individuals have fewer articles per dorsal cirrus, larger individuals more. Although, such size-related variation does exist in *D. mangalis* and the relationship appears quite linear, the mean number of articles per dorsal cirrus per individual does not change considerably with body length, even when the latter increases nearly five-fold (Fig. 3A). Furthermore, not only is the number of articles comprising a dorsal cirrus on *D. mangalis* small compared to *D. carolinae* and *D. junoyi*, but it also varies little along any one individual (Table 2).

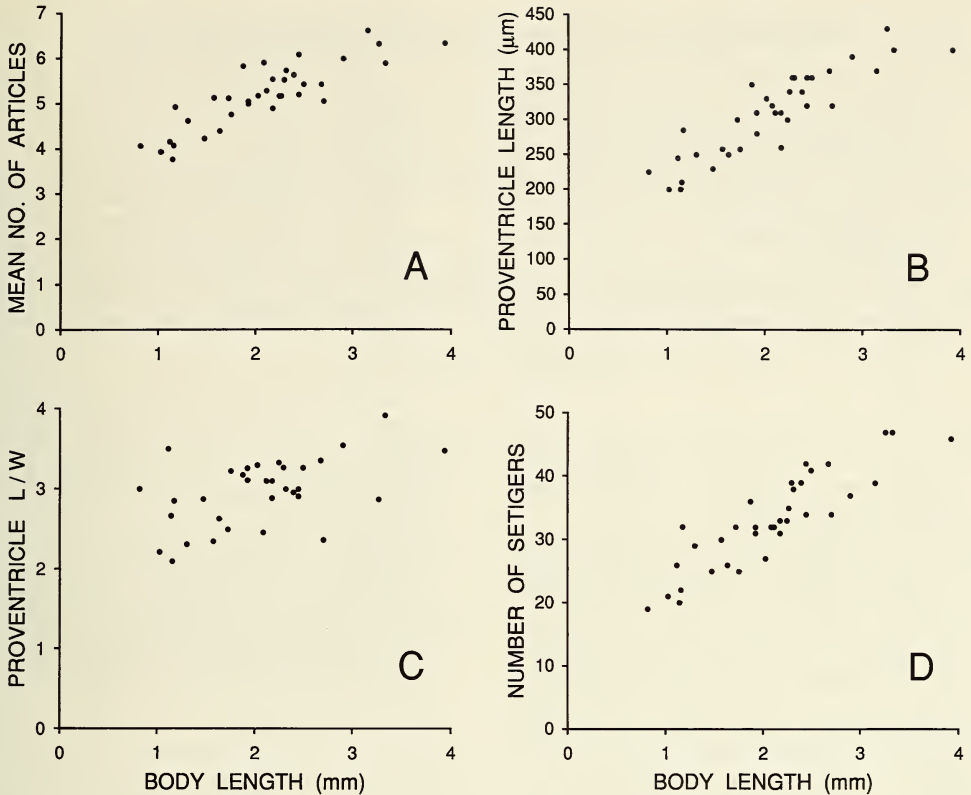


Fig. 3. *Dentatisyllis mangalis* type material. Relationship between body length and (A) mean number of articles in dorsal cirri for each individual ( $r = 0.858$ ,  $n = 35$ , see Table 2 for variation associated with each mean), (B) proventricle length ( $r = 0.892$ ,  $n = 35$ ), (C) proventricle length to width ratio ( $r = 0.503$ ,  $n = 33$ ), and (D) total number of setigers ( $r = 0.886$ ,  $n = 35$ ).

Other observations on the relationship between morphological variation (such as that in proventricle length or the proventricle length to width ratio) and growth have been noted in the species description.

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